FIG. **4** illustrates how the probe pin is like in use;

FIG. **5**A is a longitudinal section of another probe pin whereas FIG. **5**B is a bottom view thereof;

FIG. **6** illustrates how the probe pin assembly of FIG. **5** is like in use;

FIG. **7** is a conventional probe pin assembly;

FIG. **8** is an elevation of the conventional probe pin, partly broken to show the inside;

FIG. **9** is an elevation of a conventional DIP-type of probe pin, partly broken to show the inside;

FIG. **10** is an elevation of a conventional right-angled type of probe pin, partly broken to show the inside; and

FIGS. **11**A and **11**B are elevations of a conventional right-angled type of probe pin having a separate post integrally connected thereto, partly broken to show the inside.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIG. **1**, an elongated strip of thin metal sheet **4** has a perforated edge **2** on one longitudinal side for feeding the thin metal sheet **4** in one direction. First, a hole **5** is made in the thin metal sheet **4**. The hole **5** becomes the front opening of a sleeve **6** to be made. The portion around the hole **5** is drawn deeply with dies making the hole **5** center to form a sleeve **6**.

The sleeve **6** thus formed is swaged to form a radial expansion **7***a* for accommodating a stationary cover. Then, the thin metal sheet **4** is cut to remove the surrounding area, leaving a rectangular flange **8** around the sleeve **6**. A plurality of flanged sleeves **8** thus sequentially formed are connected to the perforated carrier strip **3** by joint pieces **9** and these sleeves are rolled up to be transferred to the next plating step.

Then, these rolled flanged sleeves **6** are continuously fed to be plated the inner and outer walls with gold while being unrolled. The plating is a partial-plating onto the lower halves of the sleeves. On the other hand, a plurality of cover disks **10** are stamped out of another elongated strip of thin metal sheet while being fed longitudinally. As seen from FIG. **2**, a contact pin **11** and a coiled spring **12** are inserted in each flanged sleeve **6**, and then, a cover plate **10** is press-fitted in the swaged opening **7***a*. Then, the cover plate **10** is fastened to the sleeve **6** by crimping the swaged circumference around the cover plate **10**.

Then, each sleeve **6** is separated from the carrier strip by cutting the joint piece **9**. One or more sleeves **6** thus separated are put in a metal mold to be insert-molded by injecting a synthetic resin material into the metal mold. Then, a connector **14** having a sleeve **6** embedded in a housing mold **13** result.

Each gold-plated sleeve **6** is separated from the perforated carrier strip subsequent to loading it with a contact pin and a coiled spring and to closing the so loaded sleeve with a cover disk. Instead, each gold-plated sleeve **6** may be separated from the carrier strip **3**, and then, sleeves thus separated may be loaded with contact pins **11** and coiled springs **12**, and the so loaded sleeves may be closed with cover disks **10** by press-fitting the cover disks into the sleeves and by crimping their swaged ends around the cover disks **10**. These works may be automatized.

The connectors thus produced may be of surface-mounting type (SMT) as shown in FIGS. **3** and **4** or right-angled type as shown in FIGS. **5** and **6**, where the connector **14***a* has its flange **8** bent at a right angle. FIG. **6** shows how the connector can be mounted on a circuit-printed board **16**.

A metal reinforce **15** may be used in mounting a connector (see FIG. **6**). A connector can be formed to be of DIP-type by bending its flange **8** or joint piece **9** to provide a right-angled post such as indicated at **22** in FIG. **11**.

As may be understood from the above, a plurality of sleeves are formed by stamping and deep-drawing a thin sheet of metal with dies. This facilitates the producing of sleeves, and accordingly the cost and time involved can be substantially reduced. Still advantageously, the stamping and deep-drawing of thin metal sheet with dies permits a variety of sleeve shapes to be produced, and sequential extra pressing permits further modifications of such sleeves to provide for examples, DIP-type or laid-flat type connectors. The deep-drawing causes appearance of hardly visible longitudinal scars extending in the same direction as the contact pin moves in the sleeve, thus reducing significantly the friction with which the contact pin moves in the sleeve.

Use of an elongated strip of thin metal sheet permits the rolling and unrolling of the material in the course of production, thus facilitates the automatization of all manufacturing and assembling processes.

Thanks to the use of thin metal sheet in producing sleeves the resultant sleeve can have a reduced thickness, thus better meeting an ever increasing demand for reduction of weight and thickness for instance in cellular phones. In producing right-angled probe pin assemblies there is no fear of causing appearance of cracks in their posts in bending, which cracks are prone to appear in producing right-angled probe pin assemblies according to the conventional method. Still advantageously, use of elongated strip of thin metal sheet facilitates the plating of inner surfaces of sleeves, which plating can be effected at selected places on the metal sheet in unrolling the elongated strip upstream of stamping and deep-drawing stations. Sleeves which are made by machining as in the conventional method cannot be gold-plated inside adequately without allowing the outside to be coated thick three times as much as inside. Thus saving of gold reduces significantly the manufacturing cost. The closing of sleeves with cover disks effectively prevents the rising-and-invading of soldering material in the sleeve.

What is claimed is:

1. A probe pin assembly comprising:

one or more sleeves which are formed by stamping and deep-drawing a thin sheet of metal with dies;

contact pins slidably fitted in the sleeves;

resilient members contained in the sleeves to spring-bias the contact pins with their tip ends appearing from the sleeves; and

cover plates for closing rear openings of the sleeves, thereby preventing the resilient members from springing out from the sleeves wherein said sleeves are plated only on lower halves of said sleeves.

2. The probe pin assembly according to claim **1** further comprising an insulating housing mold having the probe pin assembly embedded therein.

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